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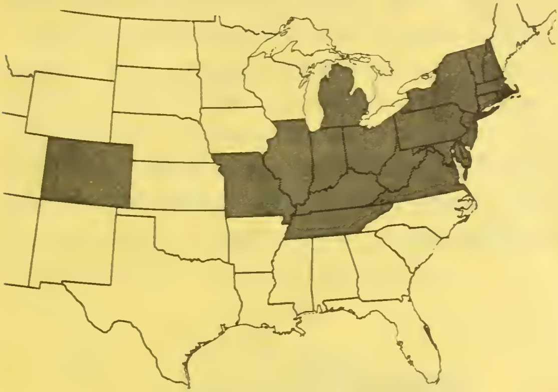
CONTROL of DUTCH ELM DISEASE and ELM PHLOEM NECROSIS

Agricultural Research Administration
U. S. DEPARTMENT of AGRICULTURE

June 1952 LEAFLET NO 329

Prepared by the Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, and the Division of Forest Pathology, Bureau of Plant Industry, Soils, and Agricultural Engineering.

DUTCH ELM DISEASE and **ELM PHLOEM NECROSIS** are the most destructive diseases of elm trees in the United States. The Eastern and Central States particularly have lost great numbers of beautiful elms from one or both of these diseases. They continue to spread and may soon become serious problems wherever elms are much used as shade trees.



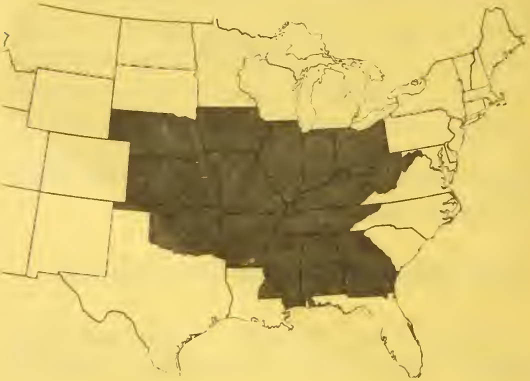
Known distribution of Dutch elm disease in the United States.

How These Diseases Are Spread

Dutch elm disease is caused by a fungus. Elm phloem necrosis is a virus disease. Both these diseases are spread chiefly by insects. In the United States the smaller European elm bark beetle most commonly carries Dutch elm disease, but the native elm bark beetle also carries it. A leafhopper spreads elm phloem necrosis. These insects carry the infection from diseased to healthy elms. Both diseases may also be spread through root grafts, particularly in close plantings and dense natural stands.

Elms Affected

The Dutch elm disease may attack all elms commonly grown in the United States and species of the related genera Zelkova and Planera. The American elm is the most susceptible. Other native and European elms are moderately to highly susceptible. The Siberian and Chinese elms are resistant. Occasionally a few trees of ordinarily susceptible species will resist the disease.



Known distribution of elm phloem necrosis in the United States.

Elm phloem necrosis does great damage to the American and the winged elm, although some resistant trees of both kinds have been found. Other elms seem to resist this disease.

The Christine Buisman elm, a selection of the European smoothleaf elm, is highly resistant to both the Dutch elm disease and elm phloem necrosis.

Symptoms of Elm Diseases

When elm leaves suddenly wilt, yellow, or dry, thin out, and then drop off, the tree may have one of these diseases (see cover). Diseased trees may live only a few weeks, or it may be a year or more before they die.

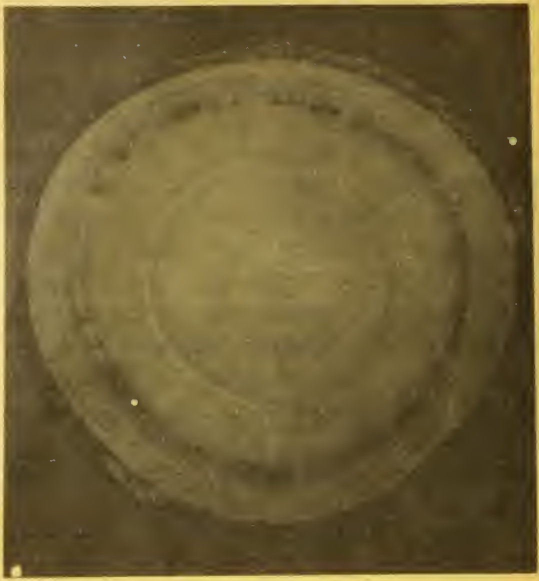
In Dutch elm disease such symptoms usually appear first on only a branch or two, and then spread to other top parts. Elm phloem necrosis, on the other hand, usually affects the entire top instead of just a few branches. As the disease progresses, these symptoms become more noticeable.

Diagnosis

Dutch elm disease can be diagnosed correctly only in a laboratory equipped for identifying the fungus.

If your elm trees show the foliage symptoms described above, cut off several small branches with the affected leaves. Look for a brown discoloration in one or more annual rings of the wood. This brown color may show up as spots, a stippling, or a partial or complete ring. Dutch elm disease is not present unless this discoloration appears.

If you find this brown color, send four or more branches so discolored to your State Agricultural Experiment Station for laboratory diagnosis. The pieces should be about 1/2 inch in diameter and 6 inches long.

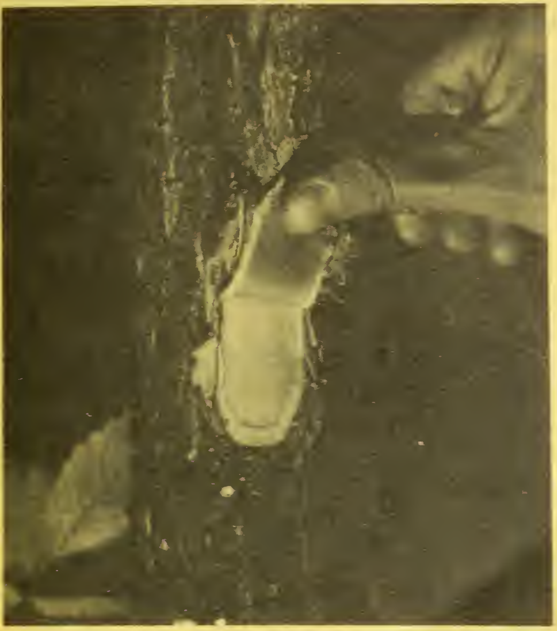


Discoloration caused by Dutch elm disease.

You can identify elm phloem necrosis yourself.

Cut through the bark at several places around the lower trunk or on buttress roots and pry the bark from the wood so that you can see the inner bark. If the inner bark that lies next to the wood is yellow or the color of butterscotch, sometimes flecked with brown or black, the elm probably is diseased with phloem necrosis. If the inner bark is white and turns brown only after exposure to air, the leaf symptoms are not caused by phloem necrosis.

If you find the butterscotch color, remove a piece of bark from the tree. From this bark strip the discolored inner layer and put it in a small stoppered vial, or hold it in your closed hand for a few minutes. Elm phloem necrosis is present if the discolored tissue gives a faint odor of wintergreen.



Discoloration caused by phloem necrosis is confined to the thin bark layer in contact with the wood.

Keeping the tissue in a stoppered vial for a few hours in a warm place will bring out the wintergreen odor even when it is very faint.

First Aid for Dutch Elm Disease

Sometimes you can prune Dutch elm disease out of a tree if you find it in very early stages, before it reaches the tree trunk. There is no other known cure for Dutch elm disease, and none for elm phloem necrosis.

Finding and destroying breeding places of elm bark beetles early also helps to control Dutch elm disease. These beetles breed only in elm wood such as broken limbs, wood piles, recently felled trees, or those that have died rapidly from disease or other causes. Burn such material, or spray all bark surfaces with a 1-percent DDT emulsion or oil solution.

Control by Spraying

You can control these elm diseases by preventing attack of the insects that commonly spread them. You can do this best by applying a DDT spray. Use either a hydraulic sprayer or a mist blower. The sprays we recommend will not damage elms or associated vegetation.

Spray Schedule

To control Dutch elm disease only, use a dormant spray before the elm leaves appear and a foliar spray about 90 days later.

To control elm phloem necrosis only, use a foliar spray when the elm leaves are full grown--usually in June and before July 1. Apply a second foliar spray about mid-August.

To control both diseases, use a dormant spray before elm leaves appear, and a foliar spray when elm leaves are full grown, usually in June. About mid-August use a foliar spray as a third and last spray.

Preparation of Sprays

Prepare a DDT emulsifiable concentrate by dissolving 294 pounds of technical DDT in 74 gallons of xylene and adding 19 pints of Triton X-100. Mix thoroughly. You can store this concentrate indefinitely in a sealed container at 50° F. or higher. If it is to be exposed to lower temperatures, add 9 gallons of acetone to each 100 gallons.

Just before using, dilute this concentrate with water as indicated below.

To make 100 gallons of a dormant spray, use 5 1/2 gallons of the concentrate for the hydraulic sprayer or 32 gallons of concentrate for the mist blower. If you use a mist blower, add 12 gallons of white oil.

To make a foliar spray use half as much concentrate and white oil as for the dormant spray.

Make all dilutions under constant agitation. Increase the amount of concentrate by 10 percent if it contains acetone.

Spray Thoroughly

To be effective, these sprays must thoroughly cover all parts of the tree upon which the insects feed--all bark surfaces for Dutch elm disease carriers and all leaf surfaces for phloem necrosis carriers. Spray more carefully and thoroughly than you need to spray to control leaf-eating insects.

Prevent Damage from Spider Mites and Aphids

Because DDT destroys natural insect enemies of spider mites and aphids, you may find that these two pests build up and cause a great deal of damage after you have been spraying with DDT. To control these pests, add a miticide or aphidicide to the foliar spray you are using for elm disease control. Be sure the material you use can be mixed with DDT.

PRECAUTIONS

Handle solvents and DDT concentrates carefully. The solvents, including acetone, are flammable, and their fumes may be toxic. Keep them away from fire. DDT concentrates are also toxic. If you spill any on the skin, wash with soap and water.

DDT can also poison wildlife, such as birds and fishes. Do not let the spray get into bird baths or fish pools. Do not let it form puddles beneath the trees or along street curbs where birds may come to drink.

Scientific Names

The scientific names of the elms, the disease organisms, and the insects that transmit them are given below.

American elm - - - *Ulmus americana*
Siberian elm - - - - - - - *Ulmus pumila*
Chinese elm - - - - *Ulmus parvifolia*
European smoothleaf elm
Ulmus carpinifolia
Winged elm- - - - - - - - - *Ulmus alata*

Dutch elm disease fungus
Ceratostomella ulmi
Elm phloem necrosis virus
Morsus ulmi

Smaller European elm bark beetle
Scolytus multistriatus
Native elm bark beetle
Hylurgopinus rufipes
A leafhopper - - *Scaphoideus luteolus*

☆ U. S. GOVERNMENT PRINTING OFFICE : 1952 O—212649

For sale by the Superintendent of Documents, U. S. Government
Printing Office, Washington 25, D. C. - Price 5 cents

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JUL 3 1952
U.S. DEPT. OF AGRICULTURE